acter **400**. Percussion instrument **400** can include some of the same general sections as FIG. **1**, thus like sections are referred to by the same reference character but with the first digit being a "4" instead of a "1".

[0057] FIG. **4** shows an instrument having the shape, and general operation of a bass drum, of the type typically included with a drum kit and used in conjunction with a foot pedal. A body **402** can orient a playing surface **404** with respect to a foot pedal assembly **420**, to enable playing surface **404** to be struck by a mallet of foot pedal assembly **420**. A playing surface **404** can be substantially smaller in contact area than the skin area of a conventional bass drum, allowing for a more compact structure than an acoustic bass drum.

[0058] In this way, an instrument can have the same general structure of a counterpart acoustic instrument, but include a smaller playing surface area.

[0059] The above embodiments have shown arrangements in which an instrument can have a playing surface that includes capacitance sensors. While such playing surfaces can be integrated onto instruments in an essentially permanent fashion, alternate embodiments may include removable playing surfaces. Even more particularly, it may be desirable to provide playing surfaces that can be removably fixed to existing acoustic instruments. Such removable playing surfaces can provide the dual functions of (1) generating sound indications/values with capacitance sensing and (2) deadening any sound generated by the acoustic instrument.

[0060] Preferably, a removable playing surface can take the form of a mat structure that can be placed over surfaces of the acoustic instrument, enabling the mat structure to be struck in lieu of a sound generating membrane or other structure.

[0061] Two of many possible configurations are shown in FIGS. **5** and **6**.

[0062] Referring now to FIG. **5**, a percussion instrument having a removable capacitance sense playing surface according to a one embodiment is shown in a side cross sectional view, and designated by the general reference character **500**. An instrument **500** can be shaped to conform to an acoustic playing surface of a known percussion instrument, and in the very particular example of FIG. **5**, can conform to the skin (membrane) **532** of a "tom" type drum **530**.

[0063] An instrument can include a playing surface **504**, having one or more capacitance sensors that can provide a capacitance that can vary in response to a percussive event. Capacitance sensors (e.g., **506-0** and **506-1**) can be connected by a signal path **508** to inputs of a controller assembly **510**. Because instrument **500** can have a conformal shape, a signal path **508** can be a wiring that can run on an outside surface of acoustic instrument **530**.

[0064] A controller assembly **510** can include the same components as controller assembly **110** described above, or other controller circuits described herein.

[0065] An instrument **500** can be fixed to an acoustic instrument **530** by any suitable mechanical method. Preferably, an instrument can include body **502** with a bottom portion that has some degree of flexibility, allowing instrument **500** to be snugly fit over a surface of acoustic instrument **530**. In other arrangements, flexible bands can extend from edges of an instrument **500** that can be stretched and attached to an opposite side of the acoustic instrument. For example, in the arrangement of FIG. **5**, flexible bands can be attached at one end to edge of instrument **500** and at another end to a bottom of acoustic instrument **530**.

[0066] However, in arrangements in which a corresponding acoustic instrument has a playing surface oriented in a generally horizontal configuration, an instrument **500** can be placed on an acoustic playing surface **532** and remain in position due to gravity, or with a bottom surface having a grip pattern, or some combination thereof.

[0067] Referring now to FIG. **6**, a percussion instrument having a removable capacitance sense playing surface according to another embodiment is shown in a side cross sectional view, and designated by the general reference character **600**. FIG. **6** shows an instrument **600** that can conform to playing surfaces **632** of a cymbal **630**.

[0068] A controller assembly **610** can also include the same components as controller assembly **110** described above, or other controller circuits described herein.

[0069] In the particular example of FIG. **6**, instrument **600** can bend at edges **620** to wrap around an outer edge of acoustic instrument **630**. Thus edges **620** can be formed of a flexible material, or have wedge shaped cut outs to conform to a smaller diameter when folded over.

[0070] An instrument **600** can be attached to a surface of the acoustic instrument according to any suitable technique. In the particular example of FIG. **6**, flexible bands **634** can draw generally opposing edges **620** toward one another. Preferably, instrument **600** can be flexible and include playing surfaces **604-0** and **604-1** that can be oriented on opposing sides of acoustic instrument **630**. Such a double surface can enable dampening effects, or allow instrument **600** to be included in hi-hat type cymbal configurations, or the like.

[0071] In this way, an instrument according to the embodiments can include one or more playing surfaces that can be removably fixed to existing acoustic instruments.

[0072] It is noted that removable embodiments, like those illustrated in FIGS. **5** and **6**, can be played without a corresponding acoustic instrument if placed on a suitable surface.

[0073] Referring now to FIG. **7**, one very particular example of an instrument construction, for embodiments like those of FIGS. **5** and **6**, is shown in a side cross sectional view. FIG. **7** shows a portion of an instrument **700** that includes a sensing surface **702** and a cushion surface **704**. A sensing surface **702** can include capacitance sensing structures for detecting percussive events. Particular examples of such sensing structures are described in more detail below. Cushion surface **704** can be a surface that absorbs mechanical energy of a percussive event, to thereby reduce any actual sound generated by the corresponding acoustic instrument. Preferably, a cushion surface **704** can be formed from a rubber or other elastomeric material of relatively high density, and include a "grip" type pattern on a bottom surface **706**.

[0074] In this way, instruments according to the present invention can include capacitance sensors formed over a cushion material for absorbing percussive strikes.

[0075] Referring now to FIG. **8**, a capacitance sensor that can be utilized in the embodiments will be described. A capacitance sensor can operate by detecting a capacitance between an active switch area and an adjacent grounded area. Two conductive plates **802**, **804** (or lines, or some other geometric structure), one of which is active, can have a finite capacitance C**1** between them. When a conductive striking object (stick, finger or other conductive surface) is placed in close proximity, the capacitance changes, as shown by capacitance C**2**, C**3**.